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(54) Abstract Title
Conveying apparatus

(57) A conveying apparatus 10 comprises an elongate, moveable, two ended strip 11 supported between two spaced rollers 12 and 13 and 14 and 16, said strip being supported by portions which interengage with the rollers at least one of which is powered 22 to drive the strip. The interengaging portions may be a track 17 in the strip which may be recessed or have gear teeth 23. The strip may have detachable supports 31 for articles 32 which may fit in complementary recesses 29 in the strip. The supports may carry encoding information 36 readable by a detector or may be different shapes 29a and 29b. The strip may be flexible. The pairs of rollers may be arranged in various linear configurations (figures 4 and 5) or as an array (figure 7) such that the strip may be transported around a factory.

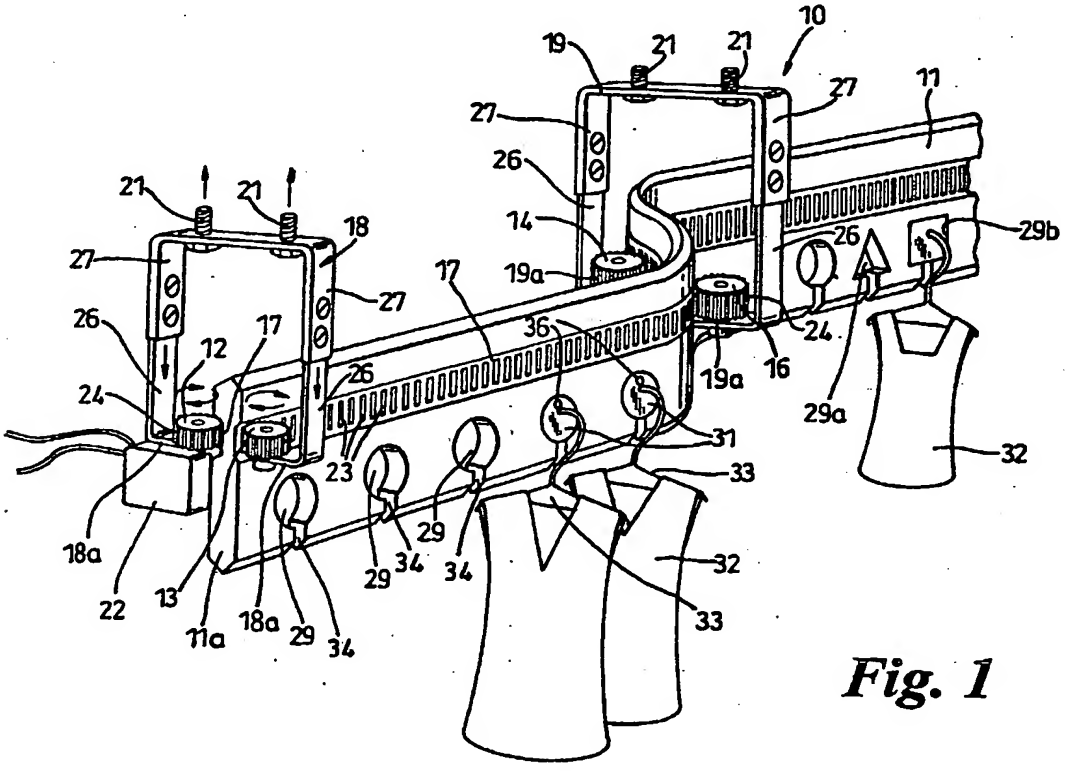

Fig. 1

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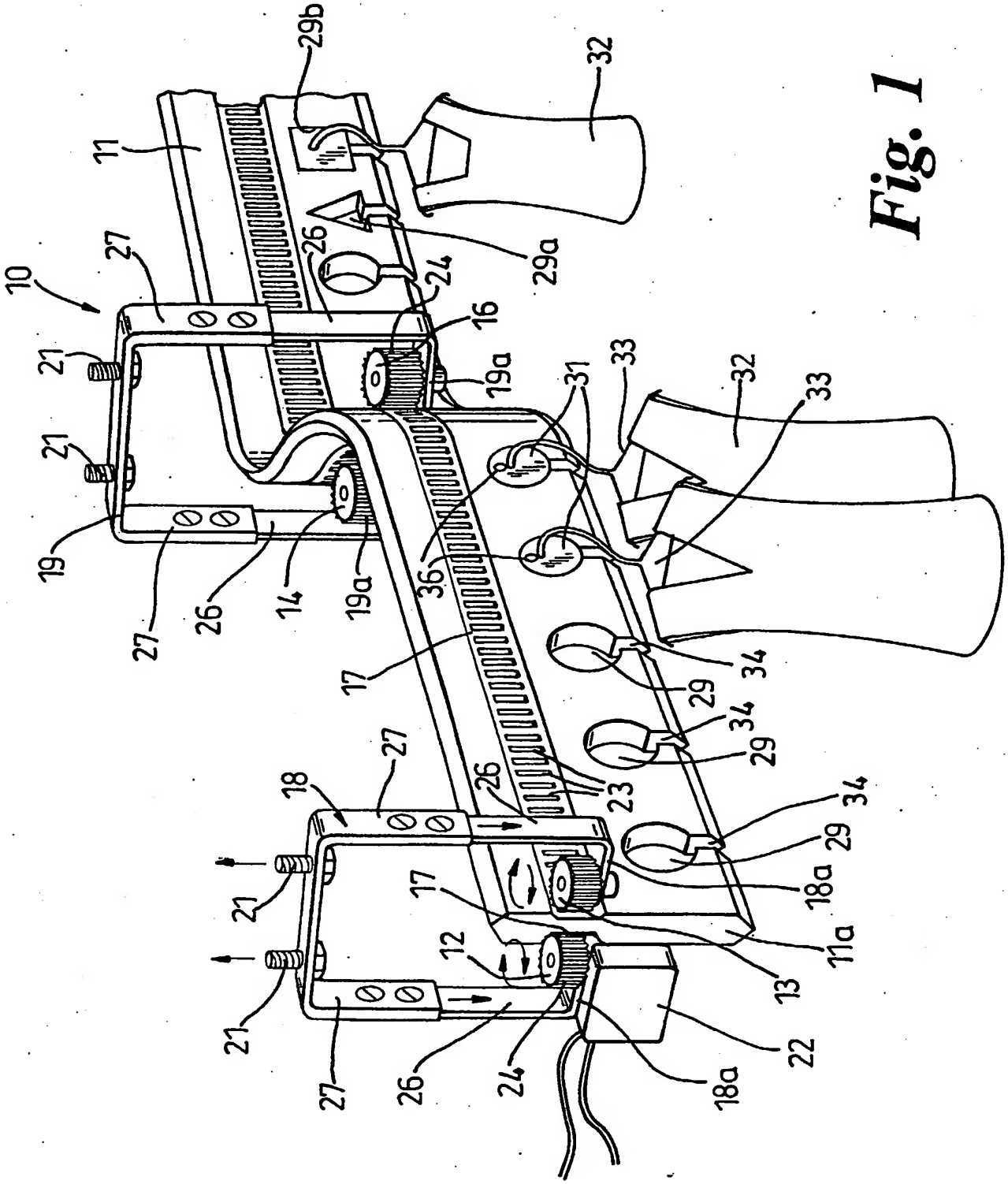

Fig. 1

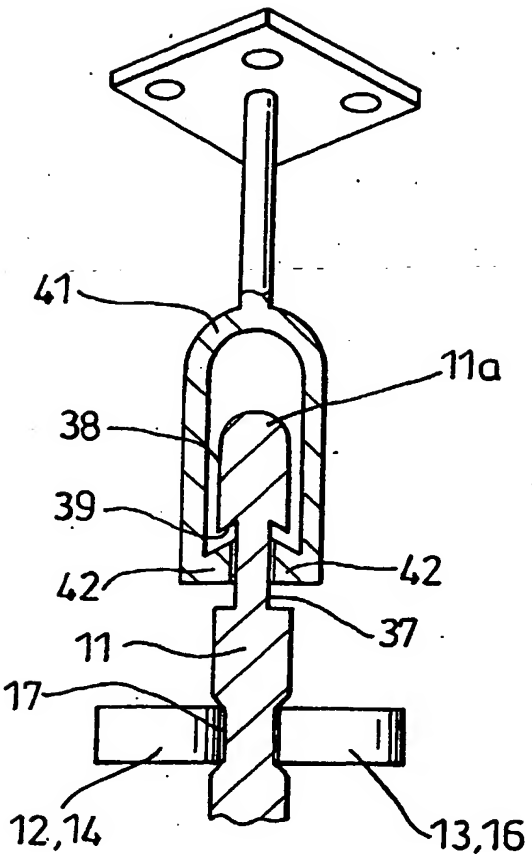

Fig. 2

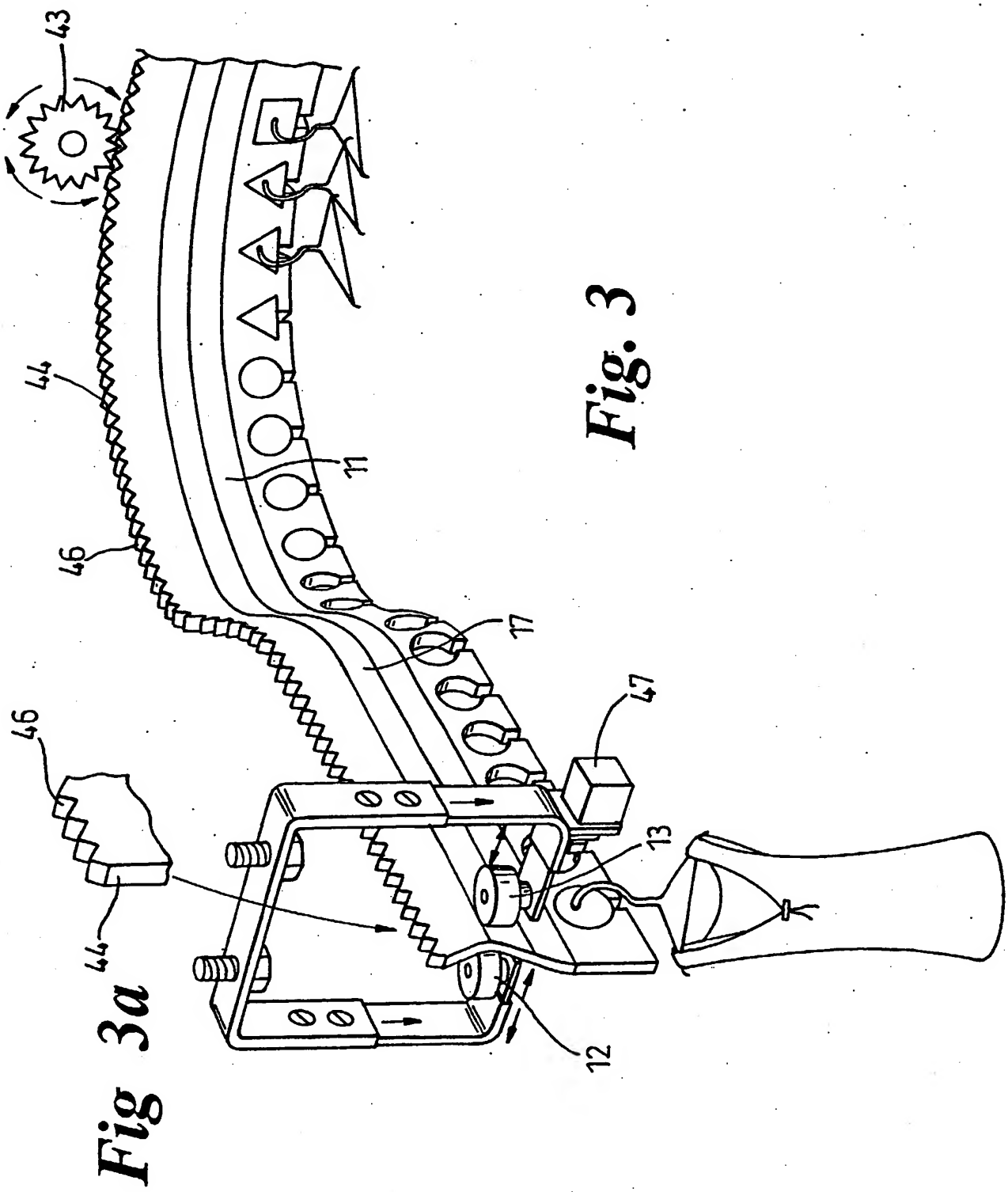

Fig 3a

Fig. 3

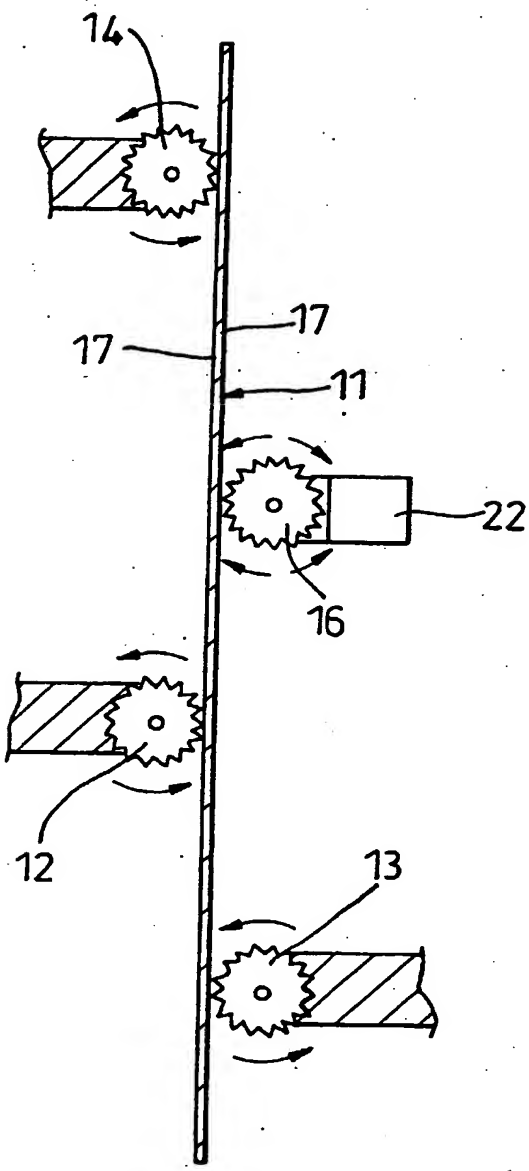

Fig. 4

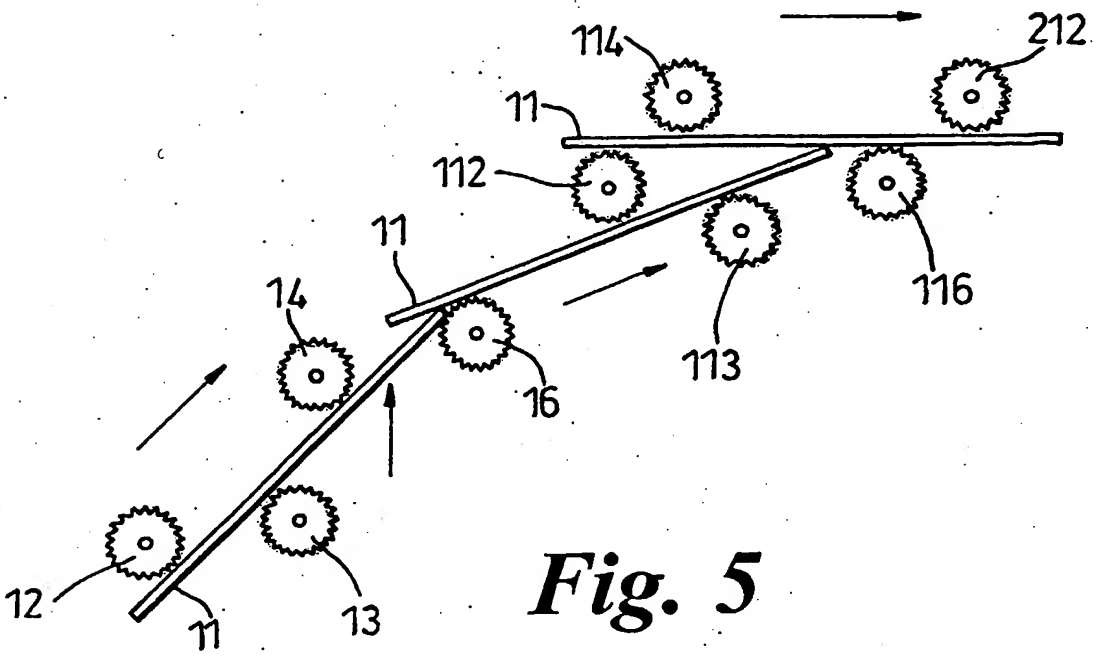

Fig. 5

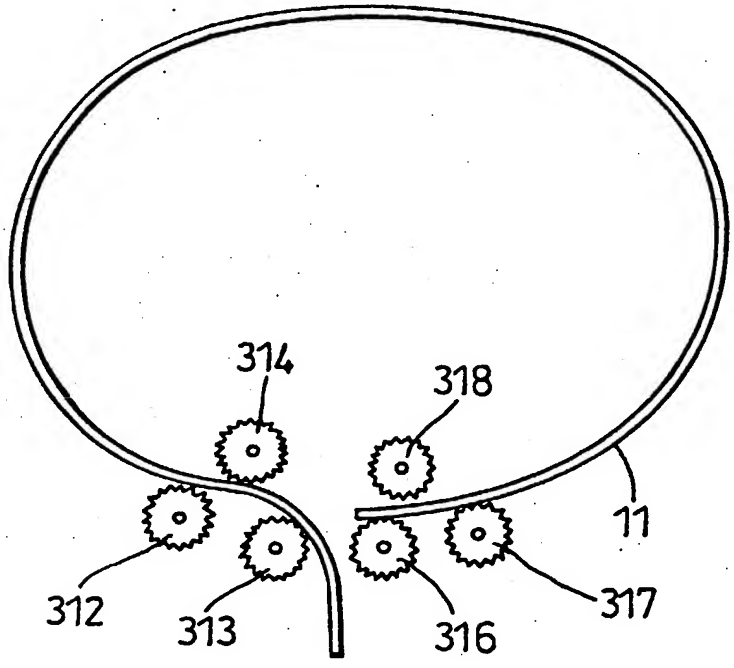

Fig. 6

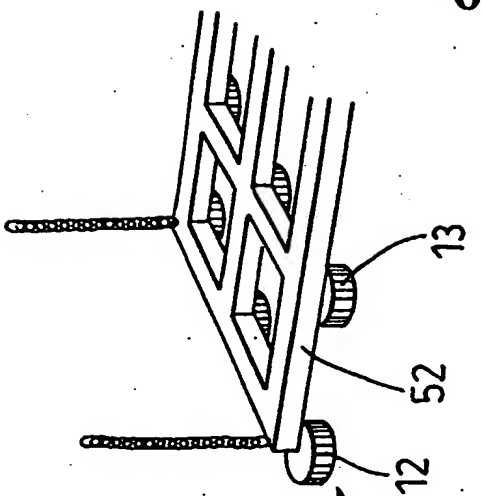

Fig. 8

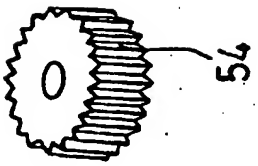

Fig 9

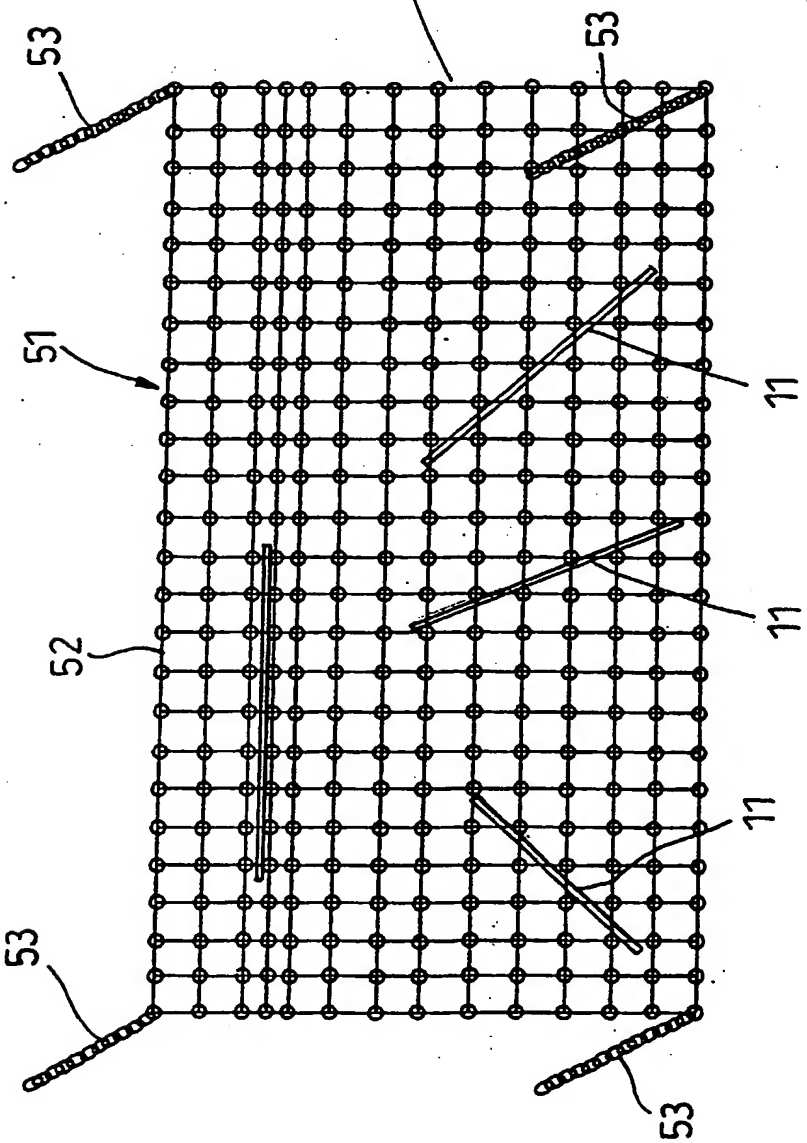

Fig. 7

A DRIVE TRANSFERRING APPARATUS

This invention relates to an apparatus and method for transferring drive.

According to a first aspect of the invention, there is provided an apparatus as defined in Claim 1.

Optional features of the apparatus are defined in Claims 2 to 28 hereof.

The invention also resides in a vehicle or building as defined in Claim 29.

According to a second aspect of the invention there is provided a method as defined in Claim 30.

Optional features of the method are defined in Claims 31 and 32 hereof.

There follows a description of preferred embodiments of the invention, by way of non-limiting example, with reference being made to the accompanying drawings in which:

Figure 1 is a perspective view of part of a first embodiment of apparatus according to the invention;

Figure 2 is an end elevational view of a second embodiment of apparatus according to the invention;

Figures 3 and 3a are perspective views of a third embodiment of apparatus according to the invention;

Figure 4 is a plan view showing one possible arrangement of drive members and rollers constituting part of an apparatus according to the invention;

Figure 5 is a plan view of a further embodiment of the invention, including a number of moveable strips;

Figure 6 is a plan view of a further embodiment of the invention, employing a flexible strip;

Figure 7 is a plan view of a matrix or array constituted by a plurality of apparatuses such as those shown in Figures 1, 2 or 3;

Figure 8 is a perspective view of part of the array of Figure 7; and

Figure 9 shows in perspective view a gear or cog wheel forming part of the Figure 7 array.

Referring to the drawings and initially to Figure 1, a drive-transferring apparatus 10 includes an elongate, moveable, two ended strip 11 that is supported between two pairs of mutually spaced rollers 12,13,14,16.

Strip 11 is extruded, moulded or otherwise formed from a flexible material such as a lightweight plastic. Consequently strip 11 itself is flexible, as signified by the sinuous shape thereof in Figure 1.

The strip 11 need not be flexible as shown, however. Other embodiments of the invention may include a strip that does not bend appreciably in use of the apparatus.

The strip 11 is supported by a strip support arrangement with which at least a portion of the strip 11 is moveably engageable, the strip and the strip support including interengaging portions that support the strip relative to the rollers.

In the Figure 1 embodiment the strip support is constituted by a recessed track 17 impressed into either side of strip 11, and extending along the length thereof.

Track 17 may conveniently be formed during forming of strip 11.

In the Figure 1 embodiment there is a said track 17 extending at the same level on each side of strip 11. The two tracks 17 are parallel to one another.

Each track 17 is, essentially, a parallel sided, straight-bottomed U-channel.

The spacing between the pairs of rollers 12,13 and 14,16 is such that the only portion of strip 11 that will pass between the pairs is that defined in the region of the parallel tracks 17. Consequently in the Figure 1 embodiment the mass of the track 11 and any loads carried thereby is supported by the reaction of the downwardly acting mass of the strip reacting at the upper edge of each track 17 against the periphery of an adjacent roller 12,13,14,16.

To this end each roller is supported with its axis of rotation essentially vertical, on a bracket 18,19 that is fixed eg. to the ceiling or another horizontal structure of a building, for example by set screws 21.

Each bracket 18,19 is essentially an n-shaped member the downwardly depending limbs of which support the rollers 12,13,14,16 on generally horizontal plates 18a,19a that extend on either side of and towards strip 11.

The set screws 21 pass through apertures in the tops of the N-shaped members.

The lengths of the limbs of the n-shapes are adjustable, by virtue of being two part items. In the embodiments shown a lower portion 27 of each limb is slideably received in a hollow, elongate recess at the end of an associated, upper limb portion 27. Pairs of screws 28 threadedly engaged with apertures in the upper limb portions 27 are engageable in series of apertures

(not visible in Figure 1) to provide an incremental length adjustment feature for each limb.

Roller 12 of Figure 1 is powered to rotate, by virtue of an electric motor 22 supported on bracket 18 beneath roller 12.

Roller 12 is coupled directly to the output shaft of motor 22, that may be operated eg. under control of a computer.

Consequently roller 12 constitutes a powered, moveable member that is engageable with the strip 11 to drive it between the rollers 12,13,14,16. Other forms of moveable member (such as driven belts) are possible within the scope of the invention. In any event the direction of driving of the moveable member determines the direction of movement of the strip relative thereto. The driving direction of the moveable member may be under computer or other control.

Each track 17 includes a plurality of teeth 23 defining a rack extending along the length of each track 17. By virtue of the recessed nature of the tracks 17, each rack is also recessed relative to the remainder of the strip.

The periphery of each roller 12,13,14,16 includes formed thereon a continuous series of gear teeth 24 of a size and pitch suitable for driving engagement with the rack defined by teeth 23.

Consequently on powered driving of roller 12 by motor 22 the strip 11 is driven between the pairs of rollers in a positive, non-slipping manner.

Alternatives to the rack and gear tooth arrangement shown are of course possible within the scope of the invention.

For example the rollers 12, 13, 14 and 16 may exhibit a high coefficient of friction with the material of each track 17. In such an arrangement the teeth 23,24 may not be necessary.

Because it may be prone to wear, the track 17 may be faced or coated with a material that is harder than that of the remainder of the strip 11.

The strip 11 includes a plurality of supports, that are detachably secured thereto, for supporting articles on the strip as it moves between the rollers 12, 13, 14 and 16.

More specifically strip 11 includes a series of recesses 29 that in the embodiment shown pass from one side to the other through the material of the strip, in the region below the tracks 17.

A series of support members 31 are inserted into the recesses 29 to support objects such as the garments 32 shown being conveyed by virtue of movement of the strip 11 in Figure 1.

Each support member 31 is a press or interference fit in an associated aperture 29, whereby each member 31 is engageable in and removable from an associated said recess 29 in a direction perpendicular to the elongate direction of strip 11.

The majority of the recesses 29 in Figure 1 are circular. However, as exemplified by recesses 29a and 29b, this need not be so. Indeed, as discussed below there may be advantages in using a plurality of different shapes for the recesses.

Also, of course, the recesses need not necessarily pass completely through the strip 11.

The recesses 29 may be wholly or partly coloured, textured or otherwise detectably different than the remainder of the strip 11 and, if desired, from each other. For example the recesses may include inserts, regions of different material, printing or other physically detectable features.

Regardless of the precise nature and shape of the recesses, each support member 31 is generally of complementary profile to the cross section of a recess 29 in which it is insertable.

The preferred embodiment shown in Figure 1 includes a plurality of downwardly depending members, in the form of garment hangers 33 each secured to or engaged with an associated said support member 31.

The garment hangers 33 are of course ideally suited to the supporting of garments such as those shown in Figure 1. Of course if the strip 11 is intended to support other articles than garments, other forms of downwardly depending members may be employed.

For example the downwardly depending members may be eg. meat hooks, magnetic pads for supporting ferrous items; claws or grippers; tacky pads or other members for adhering to articles to be conveyed; eyes; or loops. Other forms of the downwardly depending members are also possible.

It is also possible in some embodiments of the invention to use members that extend upwardly from the support members 31 to support articles above the strip 11. Such embodiments are particularly suited to use with support members 31 that are non-circular, and hence unlikely to rotate relative to the

strip 11 during transportation of the articles.

In such embodiments it may prove necessary to support the rollers 12,13,14,16 from beneath the strip 11 instead of from above as in Figure 1.

Each recess 29 in the embodiment shown communicates with an open ended passage 34 that terminates at a lower edge of the strip 11, to permit passage therethrough of a said downwardly depending member 33. As a result of the presence of the passages 34 the support members 31 may, when the recesses 29 are through-going, be inserted into strip 11, from either side.

Each of the support members 31 may include or carry encoding information.

The encoding information may be in the form of the colour of the support member, the transparency or translucency of the support member; the reflectivity of the support member; the luminosity of the support member; the inductance of the support member; the resistivity of the support member; the mass of the support member; the capacitance of the support member; the shape of the support member; and/or the conductivity of the support member.

Such physical characteristics of the support members may be read by appropriate detecting and/or sensing device positioned eg. at locations that are periodically intercepted by movement of a track 11 passing therethrough.

Instead of using inherent characteristics of the support members as encoding information, it is equally possible within the scope of the invention to employ eg. a bar code, an acoustic code, a radio frequency code (carried eg.

by a radio frequency identification tag) and/or a radio isotope tag carried by a said carrier secured to the support member.

One example of such a device is exemplified by reference numeral 36 in Figure 1.

The tag 36 may in other embodiments of the invention lie at a different location than that shown. However, the location illustrated is particularly suitable for reading eg. of bar codes and RF tags.

Regardless of the precise kind of encoding it may be used eg. in conjunction with a controlling computer to monitor the progress of a series of articles supported by the strip through a path defined by a plurality of the pairs of rollers. The encoding information may also or alternatively be used to initiate an action such as warning an operator that an article carried by the strip 11 has reached a predetermined destination; or operating machinery to remove one or more of the support members 31 or insert one or more said members into apertures in the strip 11.

Referring now to Figure 2, there is shown another embodiment of the invention in which the strip support takes a different form.

In Figure 2 the strip 11, the rollers 12,13,14,16 and the track 17 are substantially the same as those shown in Figure 1. Consequently the strip 11 is capable of being driven between the pairs of rollers to convey articles supported on the support members inserted into the recesses 29 beneath the track 17.

However, the upper portion of the strip 11 is necked or waisted above track 17, at a region signified by reference numeral 37 in Figure 2.

Above waisted region 37, strip 11 widens at region 38 to approximately the same width as the remainder of strip 11 beneath waist 37.

The widened portion 38 above waist 37 defines a downwardly facing shoulder 39 on either side of the top of strip 11.

A support bracket 41 in the form of a stirrup member suspended from a ceiling above the strip 11 includes inwardly directed horizontal legs 42 the ends of which are spaced from one another by a distance less than the thickness of portion 38 but slightly greater than the thickness of waisted portion 37 of strip 11.

As shown, in the preferred embodiment the inwardly directed legs extend upwardly. The upper edges of the waisted portion 37 lie at similar angles to the legs, whereby the strip is self-centering relative to the stirrup.

As strip 11 is driven between the rollers 12,13,14,16, it engages support bracket 41 whereby portions 38 of strip 11 slides along the legs 42 whilst supporting the remainder of strip 11 and any loads carried thereby from waisted portion 37.

In this embodiment of the invention the rollers 12, 13, 14, 16 may as shown omit teeth. Instead the outer peripheries of the rollers may include a material whose coefficient of friction, with the strip, is high. The strip may also omit the teeth, whereby the powered rollers transmit drive frictionally to the strip 11.

In use of the apparatuses of Figures 1 and 2, the length of the strip 11 would be determined at the option of a user; as would be the number and spacing

of the pairs of rollers on the brackets 18,19.

The number of motors 22 powering the rollers could similarly be determined at the option of the user.

The result is the ability for the strip 11 to be conveyed over a long distance, if the length of the strip 11 is always greater than the spacing between successive pairs of the rollers 12,13,14,16.

In other words, as strip 11 is driven between pairs of the rollers its leading edge 11a (Figure 1, Figure 2) may be arranged successively to engage pairs of the rollers that cause movement of the strip 11 therebetween. The rear end of each strip 11 (not visible in Figures 1 and 2 in order to signify the indefinite length of the strip) successively exits the space between each successive pair of the rollers.

Because of the flexibility of the strip 11 in the preferred embodiment, the path followed by the strip is almost infinitely variable at the option of an installer of the apparatus.

Referring now to Figure 3, there is shown yet a further embodiment of the invention.

In Figure 3 none of the rollers 12,13,14,16 (of which two, labelled 12 and 13, are visible) is powered. The strip-side motor 22 of Figure 1 therefore is not present in the Figure 3 embodiment.

Instead the strip 11 is driven by a toothed pinion wheel 43 that is rotatable about a horizontal axis and whose periphery engages the top edge of the strip.

Pinion wheel 43 is coupled to the output of a drive motor that is not visible in Figure 3.

The upper edge 44 of strip 11 in Figure 3 is formed with a series of gear teeth 46 defining a drive rack that is drivingly engageable with the teeth of pinion wheel 43. It will thus be appreciate that by powering rotation of pinion wheel 43 clockwise or anticlockwise the strip 11 of Figure 3 may be driven forwardly and rearwardly between pairs of the rollers 12,13,14,16.

The strip 11 of Figure 3 is substantially the same in other respects to that shown in Figure 1. However, it not necessary to provide gear teeth in the tracks 17 on either side of strip 11. Also it is of course unnecessary to provide gear teeth formed in the other peripheries of the rollers 12,13,14,16.

In order to facilitate manufacture of strip 11 as shown in Figure 3 as an extruded item, the upper edge 44 may as exemplified by Figure 3a be formed as a discrete component (eg. by stamping or pressing) that is secured eg. by means of adhesive, heat shrinking, sweating, etc. to the upper edge of the extruded strip.

This advantageously permits manufacture of a standard form of strip, that may be modified at the option of a user to adopt either the form shown in Figure 1 (in which case the teeth 23 may be inserted into the tracks 17 eg. from a roll of gear tooth material); or the Figure 3 form in which upper portion 44 may be separately applied as shown in Figure 3a.

Alternatively, the upper edge 44 of track 11 may be formed integrally with the remainder of track 11. Such an embodiment may still be manufactured by extrusion, but would probably require post-extrusion processing to form

the teeth 46 in upper portion 44.

The choice of whether to adopt the Figure 1 or Figure 2 embodiment may be determined eg, by the duty to which the strip 11 may be put.

The Figure 3 embodiment shows in exemplary form a reader 47 of encoding information.

Reader 47 may be a bar code reader, a colorimeter, a Geiger counter, or any of a range of other devices capable of generating a signal that identifies each support member 31 passing thereby.

The reader 47 may also be capable of detecting the absence of a support member, eg. through use of a *per se* known light beam technique or a Doppler effect.

Referring now to Figure 4, there is shown in cross sectional view an embodiment of the invention that is similar to the Figure 1 embodiment. Strip 11 is in Figure 1 sectioned in the vicinity of the tracks 17, in order to illustrate the engagement of the rollers 12,13,14,16 therewith.

However, in Figure 2 the pairs of rollers 12,13; 14,16 are spaced from one another in the longitudinal direction of strip 11, in addition to being spaced laterally in order to support and drive the strip as shown in Figure 1.

The Figure 4 arrangement is particularly suitable when the strip 11 is rigid.

A motor 22 is shown in an exemplary location in Figure 4, driving roller 16.

Figure 5 shows an arrangement in which plural numbers of pairs of rollers

may be employed, in order to create a non-uniform path for a series of the strips 11. Each of the strips in Figure 5 may if desired be as shown in any of Figures 1 to 4.

It will be appreciated from Figure 5 that it is possible to change the directions of the strips by feeding them between differing pairs of rollers; and to create junctions whereat paths followed by the strips on operation of the apparatus may meet.

In the Figure 5 embodiment none of the rollers 12,13,14,16, 112,113,114,116,212 is shown as being powered to rotate; but of course in practice one or more of the rollers would indeed be so powered.

Another arrangement is shown in Figure 6, in which the rollers are arranged in a series of triangular patterns (as illustrated by 312,313,314; 316,317,318).

When so arranged the rollers function in a similar manner as those illustrated in eg. Figure 1. The biasing effect of plural rollers in the arrangement as shown permits the formation of a strip 11 into eg. a substantially circular form as shown, if the strip 11 is manufactured from a flexible material.

Such an arrangement is in use of the apparatus of benefit when it is required to hold the strips 11 pending eg. processing of the articles supported thereby.

Figure 7 shows a more sophisticated arrangement, in which an array 51 of rollers similar to rollers 13,14, etc. is supported on a framework 52.

The array 51 defines a plurality of the pairs of rollers, whereby a plurality of the strips 11 may on powered rotation of at least some of the rollers of the array 51 be driven in an almost infinite variety of paths across the array.

By virtue of judicious choice of the sequence of energising the rollers, the directions of the strips 11 may be altered during their travel across the array.

In the embodiments shown the framework 52 is suspended from eg. a roof or ceiling of eg. a building, a freight body, or a land, sea or air freight container by means of chains or other members 53. Of course other means of supporting the framework may be employed, such as but not limited to rods and cables.

Figure 8 shows in more detail, in perspective view, the framework 52 that preferably is a rigid framework fabricated eg. from welded or bolted metal to define a grid of squares. The corner of each square has downwardly depending therefrom and rotatable about a vertically orientated axis one of the rollers 12,13, etc. Each such roller depends downwardly from the members of framework 52 by a distance sufficient to allow clearance for the portion of the strip 11 protruding above the tracks 17 thereof.

The sizes of the squares of the grid are such as to permit the rollers to grip, support and drive the tracks 17 in the manner described in relation to Figure 1.

In Figure 9 there is shown an individual roller, for the purpose of indicating that at least one tooth thereof may include eg. a radio frequency identification tag, a radio isotope tag, a bar code or any other means of indicating, encoding or identifying the roller 54.

Such a tooth present in a said roller may be used eg. to indicate activation of the roller; to indicate the passage of a predetermined strip 11 therepast; or simply to indicate the overall useage of the roller; and generate a signal indicative of a need to replace it or at least the teeth defined on its periphery. In this regard the roller of 59 may include detachable teeth secured about its periphery.

Any of the embodiments shown in the drawing figures may if desired be incorporated into a building or a vehicle. Alternatively such embodiments are useable eg. outdoors to convey articles between warehouses, factories, etc.

In use of the apparatus one end of a strip 11 is fed between a pair of rollers such as rollers 14,16 of Figure 1; and one of the rollers is energised to drive the strip 11 therebetween.

The forwardmost edge 11a of the strip 11 may then successively pass between further pairs of the rollers, until it reaches its destination as determined eg. by a computer controller, or an operator operating a control element such as but not limited to a lever, operating in dependence on the encoding information in the supporting members 31 carried by the strip 11.

The computer control may also coordinate information such as that obtained from the teeth 54 of encoded rollers forming part of an array 51 through which the strips 11 pass.

It will thus be appreciated that in use of the apparatus of the invention articles may be accurately conveyed to any of a number of locations eg. within a factory or warehouse. Since there is no predetermined limit to the path that the strips 11 may follow, in use the apparatus of the invention is

highly versatile in providing the possibility of delivery of goods to specific locations at specific times, in dependence on the aforesaid computer or other control.

CLAIMS

1. A drive-transferring apparatus comprising:

an elongate, moveable, two-ended strip supported between at least two mutually spaced rollers;

a strip support with which a least one portion of the strip is moveably engageable, the strip and the strip support including interengaging portions that support the strip relative to the rollers; and

at least one powered, moveable member that is engageable with the strip to drive it between the rollers.

2. An apparatus according to Claim 1 wherein each said roller and the strip include interengaging portions that support the strip relative to the rollers.

3. An apparatus according to Claim 1 or Claim 2, wherein the interengaging portions include a track formed in the strip; and

the periphery of a said roller.

4. An apparatus according to Claim 3, wherein the track includes a plurality of teeth defining a rack and the said periphery includes a plurality of gear teeth engageable with the teeth of the rack.

5. An apparatus according to any preceding claim wherein the powered, moveable member is constituted by one of the said rollers.

6. An apparatus according to Claim 3 or any claim dependent therefrom, wherein the track is recessed relative to the remainder of the strip.

7. An apparatus according to any preceding claim, wherein the strip includes one or more supports for supporting one or more articles on the strip.

8. An apparatus according to Claim 7, wherein one or more said supports is detachably secured to the strip.

9. An apparatus according to Claim 8, wherein the strip includes one or more recesses and each said detachably securable support includes a support member of complementary profile to a said recess, whereby the member is engageable in and removable from the said recess in a direction perpendicular to the elongate direction of the strip.

10. An apparatus according to Claim 9, wherein at least one of the support members includes a downwardly depending member engageable with an article whereby to support the article beneath the strip.

11. An apparatus according to Claim 10, wherein a said recess communicates with an open-ended passage that terminates at a lower edge of the strip, to permit passage therethrough of the downwardly depending member.

12. An apparatus according to Claim 9 or any claim depending therefrom, wherein at least one said support member carried encoding information.

13. An apparatus according to Claim 12, wherein the encoding information is in the form of one or more of:

colour of the said support member;

transparency of the said support member;

translucency of the said support member;
reflectivity of the said support member;
luminosity of the said support member;
inductance of the said support member;
resistivity of the said support member;
mass of the said support member;
capacitance of the said support member;
shape of the said support member; and /or
conductivity of the said support member.

14. An apparatus according to Claim 12, wherein the encoding information is in the form of one or more of:

a bar code;
an acoustic code;
a radio frequency code; and/or
a radioisotope tag

carried by a carrier secured to the said support member.

15. An apparatus according to Claim 13 or Claim 14, including a reader or detector of the encoding information.

16. An apparatus according to Claim 3 or any claim dependent therefrom, wherein the track is faced with a harder material than that of the strip.

17. An assembly according to any preceding claim wherein the strip is flexible.

18. An apparatus according to any preceding claim, wherein the said rollers are each suspended from above the strip on a length-adjustable

support, thereby permitting adjustment of the height at which the strip lies.

19. An apparatus according to any preceding claim, wherein the said strip support includes at least one of the rollers.

20. An apparatus according to any preceding claim, wherein the said strip support includes a fixed member that is engageable with a portion of the strip, the strip being moveable relative to the fixed member.

21. An apparatus according to Claim 20 wherein the portion of the strip that is engageable with the strip support includes a downwardly facing shoulder; and the strip support includes a leg that is engageable with the shoulder.

22. An apparatus according to Claim 21 wherein the shoulder and the leg are inclined at an angle to the horizontal.

23. An apparatus according to any preceding claim, including a drive roller that is distinct from the mutually spaced rollers; and a drive track that is engageable therewith and secured to the strip.

24. An apparatus according to Claim 23 wherein an outer surface of the drive roller and the drive track are frictionally mutually engaged.

25. An apparatus according to Claim 23 or Claim 24, wherein the drive roller and drive track include mutually engageable sets of drive teeth.

26. An apparatus according to any preceding claim, including a plurality of pairs of mutually spaced rollers in a line or an array.

27. An apparatus according to Claim 26, including a plurality of the powered, moveable members.

28. An apparatus according to Claim 26 or Claim 27, including a plurality of the strips.

29. A vehicle or building supporting or containing an apparatus according to any preceding claim.

30. A method of transferring drive comprising supporting an elongate, moveable, two ended strip between at least two mutually spaced rollers; and operating at least one powered, moveable member to drive the strip between the rollers.

31. A method according to Claim 30, wherein the step of supporting the strip includes moveably engaging a portion of the strip with a strip support.

32. A method according to Claim 30 or Claim 31 including supporting and driving a plurality of the strips.

33. An apparatus generally as herein described, with reference to and/or as illustrated in the accompanying drawings.

34. A method generally as herein described, with reference to and/or as illustrated in the accompanying drawings.

Application No: GB 0102012.2 **Examiner:** Steven Gross
Claims searched: 1-34 **Date of search:** 2 July 2001

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.S): B8A (A4HC), (AX), (A16)

Int Cl (Ed.7): B65G35/06, 35/08

Other: Online: EPODOC, WPI, PAJ

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2227986 A	(DAIFUKU) See especially figures 1 and 20	1, 5, 7, 19-21, 23, 24, 26-32
X	GB 2010138 A	(STICHT) See especially figures 2, 4 and 5	1, 5, 7, 19-21, 23, 24, 26-32
A	US 5388684 A	(PECK) See especially figure 4	
X	FR 2419889 A	(CHAUSSON) See especially figure 4 and also WPI Abstract Accession Number 1980-A0611C/01	1, 5, 7, 19-21, 23, 24, 26-32
X	JP 110220292 A	(MATSUSHITA) See especially figure 2 and also WPI Abstract Accession Number 1999-504673/42	1, 5, 7, 19-21, 23, 24, 26-32

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.